DOCKET FILE COPY ORIGINAL **ORIGINAL**

Before the
FEDERAL COMMUNICATIONS COMMISSION
Washington, D.C. 20554

In the Matter of	)	
	)	CS Docket No. 99-250
Petition for Rulemaking to Amend	)	
Eligibility Requirements in Part 78	)	RM No. 9257
Regarding 12 GHz Cable Television	)	
Relay Services	)	

COMMENTS OF RCN TELECOM SERVICES, INC.

TABLE OF CONTENTS

SUMMARY

Under Section 78.13 of the Commission's rules, 47 C.F.R. § 78.13, frequencies in the Cable Antennae Relay Service's ("CARS") 12 GHz band may only be licensed by operators of certain types of multichannel video programming distribution ("MVPD") systems including franchised cable systems, Multichannel Multipoint Distribution Services, Multipoint Distribution Services and Instructional Television Fixed Services. Operators of other systems that offer the exact same types of service, such as private cable operators ("PCOs"), are not eligible for licenses in these bands.

RCN believes the Commission should amend its rules to permit PCOs to have access to CARS licenses on terms and conditions equal to those of current licensees. This would permit PCOs to use the 12 GHz band to deliver multichannel video programming in the same manner and at the same cost as their competitors. PCOs would not use the channels any differently than the current licensees and there is no reason to conclude that PCOs would pose a greater risk of interference than any other current service operator eligible for CARS licenses.

The propagation characteristics of the 12 GHz band make it a superior medium for use as an MVPD network backbone when compared to other frequencies available to PCOs, such as the 18 GHz and 23 GHz bands. Not all microwave frequencies are of equal value in transmitting video programming over long distances. Signals transmitted at 12 GHz can span significantly longer distances without degradation than those transmitted at 18 GHz and 23 GHz. The propagation characteristics of the 18 GHz band are such that it is simply not as cost-effective to operate a video transmission network in that band as it is to operate a network in the 12 GHz band.

The PCOs' main competitors, namely the franchised cable companies, currently have access to the 12 GHz band and are therefore able to operate their microwave relay networks in a more cost effective manner than are the PCOs who only have access to the 18 GHz band. This amounts to an unfair commercial advantage arising solely from the existence of a regulatory anomaly. Use of the 12 GHZ band would allow PCOs to extend their services to areas they are not currently able to reach on a cost-effective basis and to therefore compete in a more effective manner in the market for MVPD services. This would permit RCN to continue its efforts to achieve the goals of the Telecommunications Act of 1996 in promoting competition, securing lower prices and higher quality services for consumers and encouraging the rapid deployment of new telecommunications technologies.

Before the
FEDERAL COMMUNICATIONS COMMISSION
Washington, D.C. 20554

In the Matter of	)	
	)	CS Docket No. 99-250
Petition for Rulemaking to Amend	)	
Eligibility Requirements in Part 78	)	RM No. 9257
Regarding 12 GHz Cable Television	)	
Relay Services	)	

COMMENTS OF RCN TELECOM SERVICES, INC.

RCN Telecom Services, Inc., and its affiliates ("RCN"), by its undersigned counsel and pursuant to the Commission's Notice of Proposed Rulemaking ("NPRM"), respectfully submits these Comments in the above-captioned proceeding.[1] RCN, through subsidiaries, uses microwave distribution networks to provide multichannel video program distribution ("MVPD") services and telecommunications services in various markets throughout the United States. RCN's MVPD networks currently use 18 GHz microwave systems as a backbone network for the simple reason that 18 GHz is the only suitable band available.[2] Given the inherent technical constraints of the 18 GHz band, RCN seeks to gain eligibility to operate in the 12 GHz band of the Cable Antennae Relay Service ("CARS"). RCN encourages the Commission to amend its regulations to enhance competition in the video and telecommunications markets by expanding the eligibility for CARS licenses to include private cable operators ("PCOs") and open video systems ("OVS").

---

[1] *Petition for Rulemaking to Amend Eligibility Requirements in Part 78 Regarding 12 GHz Cable Television Relay Services*, RM 99-9257, Notice of Proposed Rulemaking, FCC 99-166, - - FCC Rcd - - (rel. July 14, 1999) ("*NPRM*").

[2] RCN has found that the propagation characteristics of the 23 GHz band renders it unsuitable for use as a fixed operational backbone network.

I. DESCRIPTION OF RCN'S MVPD NETWORKS AND SERVICES

RCN, through subsidiaries and in combination with other entities, provides competitive video and telecommunications services to customers located in numerous states, including Massachusetts, Pennsylvania, New Jersey and New York, and intends to enter several additional markets in the near future, including the Washington, D.C.-metro area.[3] RCN uses a network composed of microwave systems, fiber optic conduit, and combinations of both to deliver MVPD services in its markets.[4] RCN offers a competitive package of 72 channels of video programming, which it typically offers in a branded package with local and long distance telephone service and high-speed Internet access that typically exceeds the services offered by traditional wireline cable operators in terms of both quality and price. These services are in direct competition with traditional franchised incumbent cable operators ("ICOs") and other MVPD providers including satellite providers. The types of systems operated by RCN are often referred to as "private cable systems" because they do not cross any public rights-of-way and therefore do not require a local cable franchise.

II. THE COMMISSION SHOULD AMEND SECTION 78.13 OF THE RULES TO MAKE PRIVATE CABLE OPERATORS AND OPEN VIDEO SYSTEM PROVIDERS ELIGIBLE FOR CARS LICENSES

RCN applauds the Commission's efforts in initiating this proceeding to consider expanding access to CARS 12 GHz frequencies to a broader range of competitive video programming providers. As the Commission is well aware, the entire telecommunications industry, including

---

[3] On January 26, 1998, the Commission granted Starpower Communications, LLC, an enterprise jointly owned by RCN and Potomac Electric Power Company, certification to operate an open video system in the Washington, D.C.-metro area.

[4] The Commission also has granted RCN certification to operate a facilities-based open video system in New York, and granted RCN-BeCoCom, LLC, an enterprise jointly owned by RCN and Boston Edison Company, certification for the Boston, Massachusetts-metro area.

MVPD industry, is in the process of changing from an industry characterized by the rate-regulation of government sanctioned monopolies, to one in which rates are set by competition and smaller non-dominant carriers are encouraged to challenge incumbents for customers on the basis of price and service quality.

Although this process of change has been in progress for more than a decade, it has been edified and encouraged more recently by Congress in several pieces of federal legislation, including the Cable Act of 1992,[5] and the Telecommunications Act of 1996.[6] Unfortunately, the process of transforming a regulated industry into a market-driven industry is both lengthy and innately complicated. This is in no small part due to the prevalence of laws designed and implemented to function in a monopoly rate-regulated environment, which create unintended market distortions, when carried forward unaltered in a competitive marketplace. This is the case with the eligibility limitations currently in place for the CARS frequencies and RCN believes should be corrected in this proceeding.

Under the Commission's current rules, only franchised cable television system operators and licensees in the Multichannel Multipoint Distribution Service ("MMDS"), Multipoint Distribution Service ("MDS") and Instructional Television Fixed Service ("ITFS") are eligible for CARS licenses.[7] RCN agrees with the Commission that it should continue to be guided by the principal

---

[5] Cable Television Consumer Protection and Competition Act of 1992, Pub L. No. 102-385, § 2(b)(2) (1992)

[6] Telecommunications Act of 1996, Pub. L. No. 104-104, preamble (1996); *see, e.g.*, 47 U.S.C. § 573 (permitting competition with franchised cable operators through open video systems).

[7] 47 C.F.R. § 78.13.

that the use of the microwave spectrum should be "governed by type of use rather than type of licensee."[8] In accordance with this principal, RCN believes that PCOs and OVS providers should be made eligible for CARS licenses on terms equal to all other service providers eligible under Section 78.13 of the Commission's rules.[9] This would be consistent with the Commission's prior addition of services eligible to use CARS.[10]

A. Permitting PCOs And OVS Providers To Use The 12 GHz Band Will Further The Pro-Competitive Goals Of 1996 Act

RCN's market entry strategy relies heavily upon microwave networks for use in delivering multichannel video programming to its customers. Under this strategy, RCN first constructs 18 GHz microwave backbone networks to deliver programming from its central headend to multiple facilities located miles away at individual multiple dwelling unit ("MDU") buildings. The video programming then is delivered over the microwave backbone network to the MDU, where it is carried over fiber optic or coaxial cable to individual subscribers in the immediate vicinity of the microwave link. Once a subscriber base in a particular area is sufficiently established, the microwave backbone is replaced with a fiber network and a new microwave network is constructed in areas not yet served by RCN.

---

[8] *NPRM* at ¶ 15 (quoting *1990 Report and Order*, 5 FCC Rcd at 6423).

[9] 47 C.F.R. § 78.13.

[10] *See Amendment of Parts 21, 43, 74, 78 and 94 of the Commission's Rules Governing Use of the Frequencies in the 2.1 and 2.5 GHz Bands Affecting: Private Operational-Fixed Microwave Service, Multipoint Distribution Service, Multichannel Multipoint Distribution Service, Instructional Television Fixed Service, and Cable Television Relay Service*, Docket No. 90-54, Report and Order, 5 FCC Rcd 6410 (1990) (expanding the eligibility of CARS to include multipoint distribution services, multichannel multipoint distribution services and instructional television fixed services).

The use of microwave networks for initial entry is employed because these networks are less expensive than fiber or cable networks. Fiber networks are preferred on a permanent basis because they have more capacity and are more reliable.[11] As between microwave networks, a lower frequency, like 12 GHz, is preferable to a higher frequency, like 18 GHz because the propagation characteristics of the lower frequency is better suited for microwave backbone networks which need to cover longer distances. Beginning at about 10 GHz, absorption, scattering and refraction by atmospheric gases and the various forms of precipitated water vapor such as rain, fog, sleet and snow, become the important limiting factors for electromagnetic wave propagation.[12] Put simply, the "light" from a microwave transmitter is easily obscured by rain, much in the way the light from automobile headlights are obscured by fog. This phenomena, known colloquially as "rain-fade," is so severe that frequencies in which the wavelength approaches the average size of a raindrop, about one millimeter,[13] have traditionally been much less desirable for use as long-haul microwave networks.[14]

---

[11] A single fiber line has a capacity of 2400 Mb/s (48 DS-3 circuits), while a microwave channel has less than one tenth of that at 135 Mb/s (3 DS-3 circuits). National Telecommunications and Information Administration, U.S. Department of Commerce, U.S. National Spectrum Requirements: Projections and Trends, Chapt. 2 (1995), <http://www.ntia.doc.gov/openness/sp_rqmnts/contents.htm> ("*NTIA Report*").

[12] *See id* at Chapt. 8.

[13] This range includes wavelengths between about 15-35 GHz.

[14] *See id.* at Chapt. 2. RCN notes that while there are exciting new technologies and services becoming available for higher spectrum use, these tend to be high-power, short-haul point to multi-point services where system-wide reliability is less of a controlling factor. To the extent that the Commission seeks comment on the suitability of the 23 GHz band as an alternative for the 12 GHz band, RCN submits that the propagation characteristics of the 23 GHz band render it virtually useless as a long-haul MVPD backbone network system.

In the NPRM the Commission expressed scepticism regarding RCN's earlier representation about the disparity in distances covered using 12 GHz systems as opposed to 18 GHz systems.[15] This point warrants further clarification. Providing a video delivery service of commercial quality requires that the end customer receive a signal with 99.99% accuracy in a give year. As discussed above, microwave signals operating at frequencies above 15 GHz tend to be easily obscured by precipitation. In areas where there is significant rainfall, such as the east coast of the United States, reducing rain-fade signal loss to a commercially acceptable level, 99.99% interruption free, requires that an 18 GHz transmitter be within two to three miles of the receive station.[16] 12 GHz transmitters, with their longer wavelength, penetrate rain and other precipitation better and can transmit between eight to ten miles before experiencing rain-fade under the worst conditions.

Furthermore, each hop in a microwave network requires reception of the signal at a repeater, translation, recomposition and then retransmission of the signal to next repeater in line. This process, using state-of-the-art equipment, can only be accomplished twice without degrading the

---

[15] *NPRM* at ¶ 18.

[16] An error rate of less than .01% equates to less than one hour of outage per year. There is no doubt that an 18 GHz signal will travel significantly further than three miles on a clear day. However, these systems must be engineered to compensate for the heaviest of rains. Consider that increasing the error rate to just 99.0% amounts to three and a half days of outage per year. A loss rate of one percent is unacceptable for any form of commercial communications, let alone a MVPD service. Thus, in order for a microwave system to retain its 99.99% reliability, equaling one hour of outage per year, the paths must be engineered so that they do not fail during heavy rain. Given that power cannot be increased above levels established in the Commission's microwave rules, the only alternative is to decrease the distance the beam travels. *See* 47 C.F.R. § 78.101. The exact distance varies depending upon terrain and ground clutter (such as buildings, antennae, transmission wires, etc.), which can scatter the beam and cause the signal to interfere with itself as the distance increases. These distances are based upon RCN's real world experience, and given the commercial need to reach as many customers as possible with a commercial quality signal, there is every incentive for RCN to extend its 18 GHz system to cover the longest distance feasible.

signal to an unacceptable level. This is because each error introduced into the signal along the way, whether by atmospheric conditions or hardware noise, is passed along and accumulates in the signal each time it is re-transmitted. This means that, in a typical 18 GHz system, a signal is transmitted from the original transmitter to a repeater three miles away, the signal is reconstituted and re-transmitted a second time to a second repeater an additional three miles away, for a total of six miles. At the second repeater the process repeats itself and the signal ends up an additional three miles away. Thus, three hops can cover up to nine miles.[17]

In a network utilizing a 12 GHz system, the significant difference is that a single hop can cover between eight to ten miles, as opposed to the two to three miles of an 18 GHz hop. As a result, a 12 GHz *network* can be expected to cover up to thirty miles, given that it can make three hops without experiencing unacceptable degradation.[18] Thus, the 12 GHz system can cover over three times the distance of a 18 GHz system, rather than ten times the distance indicated in the NPRM.[19]

---

[17] In reality, RCN does not have any 18 GHz systems that are more than eight miles long.

[18] *But see NPRM* at ¶ 18.

[19] *Id.*

B. Relative Cost Of Constructing Microwave Networks

In the NPRM the Commission sought comment on the cost difference between 12 GHz, 18 GHz and 24 GHz systems.[20] The physical difference in propagation of microwave signals at different frequencies has a direct bearing on the difference in costs of operating these systems. Because the 12 GHz system requires fewer hops to cover the same distance, it is less expensive to operate per mile than either an 18 GHz or 24 GHz system. Simply put, 18 GHz and 24 GHz systems require more equipment to reach the same number of customers. In addition, and not insignificantly, each additional hop has costs associated with the physical presence on building tops, including rent, insurance, power and the like.[21] Furthermore, in instances where an 18 GHz or 24 GHz system simply cannot reach a given area, a new headend must be constructed. At more than $1.5 million for the equipment alone, this can prove prohibitively expensive. As a result, to the extent that PCOs and OVS providers are limited to the use of the 18 GHz bands, they are also limited in the size and speed of buildout of their desired service areas. This has the effect of slowing the pace of the development of competition in the MVPD industry.

C. ICO Service Requirements Should Have No Bearing CARS Eligibility For PCOs And OVS Providers

In the NPRM the Commission noted that franchised cable system operators are generally required to provide service to the entire community while competitive providers may select which

---

[20] *NPRM* at ¶ 24

[21] In addition, the availability of suitable sites for repeaters is another factor limiting the range of an 18 GHz system. It is rare to find a suitable site at the optimal distance from a given transmitter. Instead, in most instances RCN is forced to use sites closer to the transmitter than necessary because no suitable location is available at the optimal distance.

customers they serve.[22] In relation to this observation, the Commission sought comment on how the incumbent's service requirement might come into conflict with the PCOs and OVS providers use of CARS frequencies in a given area. RCN submits that any such conflict is unlikely and does not warrant implementing discriminatory eligibility criteria.

RCN believes that the need to protect ICOs' access to CARS licenses should not be a major concern on a going-forward basis. In the MVPD industry profitability is dependent upon achieving economies of scale. The primary benefit to PCOs of having access to CARS frequencies is for use as a means of market entry while they establish a customer base large enough to support a fiber or cable infrastructure. This is especially true in urban areas where franchises are unavailable and laying cable is both prohibitively costly and time consuming. ICO systems, in contrast, are already built-out and have economies of scale making it less cost restrictive to move to fiber - - the preferred though more costly transmission medium. The majority of the ICOs have been in operation for years with unrestricted access to CARS frequencies within their service areas. This has provided them with ample time to study the needs of the community and configure their networks to achieve the most cost effective means of delivery with the resources at their disposal, including access to CARS frequencies.

In most instances the ICOs will long-ago have constructed fiber or cable networks in densely populated areas. They will also have had ample time to establish 12 GHz facilities in those areas best suited for that mode of MVPD transmission. Furthermore, to the extent that an ICO may be interested in constructing a new 12 GHz facility to serve a remote or as-yet unserved area, it is

---

[22] *NPRM* at ¶ 16.

unlikely, given the current extent of the PCO and OVS systems, that availability of CARS spectrum would be a problem. It is much more likely that in areas where the population density or terrain make the use of 12 GHz inherently superior to other networks, the ICOs will already have CARS licenses in hand to serve those areas. It is the PCOs and OVS providers, with their late access to the 12 GHz spectrum which will be shut out of these areas, not the ICOs. Finally, under the current frequency coordination system and the Commission's non-interference rules, the new entrants will simply not be permitted to build facilities that would interfere with any existing 12 GHz facilities.[23]

D. There Are No Technical Reasons Why PCOs Should Not Be Granted Access To CARS Frequencies

The Commission invited comments on the impact frequency congestion should have on their decision to open the CARS frequencies to PCOs and OVS providers.[24] RCN submits that, while frequency congestion is a significant problem affecting nearly every radio service, it and does not raise unique concerns in this instance that warrant excluding PCOs and OVS providers from eligibility for the CARS frequencies. Because the 18 GHz band is the lowest frequency band available for PCOs and OVS providers which is suitable for MVPD service, it has become heavily used by PCOs and OVS providers.[25] The number of licensed frequencies in the 18 GHz band jumped from just under 4,000 in 1991, to approximately 15,000 by 1993.[26] This jump is attributable

---

23 *See* 47 C.F.R. § 78.36(a)(1).

24 *NPRM* at ¶¶ 11, 18, 23.

25 *See NTIA Report*, Fig. 2-3.

26 *Id.*

to the fact that PCOs gained access to these frequencies in 1992.[27] By contrast, the CARS licenses during the same period remained steady at just below 11,000.[28] However, at about the same time PCOs were entering markets using the 18 GHz band, many ICOs were busy migrating their network backbones to fiber.[29] Furthermore, as the Commission noted in the NPRM, the 18 GHz band is likely to be subject to increasing use by satellite systems in the not too distant future.[30] This will, at a minimum, add new users in that band and decrease the PCOs' ability to reconfigure their microwave systems as their networks mature and grow. Thus, given that all PCO microwave backbone networks are for all practical purposes, currently restricted to operation on the 18 GHz band [31] and the fact that the ICOs have been migrating their system backbones to fiber, it appears that congestion is a more pressing concern on the 18 GHz band than on the 12 GHz band.

Furthermore, RCN submits that issues of congestion militate in favor of opening the 12 GHz band to PCOs. Spectrum congestion is only a problem for newcomers to the spectrum. Microwave licenses are assigned through a private frequency coordination system.[32] This system works on a first-come-first-served basis. Under the frequency coordinator system, a licensee seeking to establish a path in a given area must either conduct an engineering study themselves or contact a private

---

27 *Id.* at Chapt. 2.

28 *Id.* at Fig. 2-7.

29 *Id.* at Chapt. 2.

30 *NPRM* at ¶ 21.

31 *See Supra* n. 14.

32 47 C.F.R. § 78.36.

frequency coordinator to determine if the desired microwave path is clear.[33] The frequency coordinators then contact all of the other operators in the area to let them know where the microwave system is being constructed and at what frequencies it will be operated. Only after this process has finished and all interference objections are resolved, does the prospective licensee file an application for a license with the Commission.[34] Any party that thinks the proposed facility will interfere with its microwave or other operations thus has several opportunities during the process to oppose the grant of the license.[35] In addition, Commission rules give incumbent licensees immediate recourse in the event they experience harmful interference.[36] This overall system is very well established and works quite well at alleviating harmful interference between microwave facilities. Accordingly, RCN believes that concerns regarding frequency or interference from additional CARS licensees are not sufficient to warrant the continued exclusion of PCOs and OVS providers from access to CARS licenses.

E. CARS Licenses Are Not Mutually Exclusive And Should Continue To Be Assigned On A First Come, First Served Basis Using Frequency Coordination

In the NPRM the Commission suggested that license applications in the CARS service might be considered mutually exclusive and therefore subject to auction under Section 309(j) of the

---

33 *Id.*

34 *Id.*

35 *Id.*, *see also* 47 C.F.R. § 78.20 (requiring public notice prior to the grant of an application for a CARS license); 47 C.F.R. § 78.22 (permitting interested parties to file objections to the grant of a CARS application).

36 47 C.F.R. §§ 1.1; 1.91.

Telecommunications Act.[37] Independent of its position on eligibility for CARS licenses, RCN believes that auctioning licenses in the fixed operational microwave services, including CARS, would be a grave error. As discussed above, the current system of assignment of microwave services is accomplished through the use frequency coordination prior to the actual application for a license. Because the frequency coordination occurs prior to the filing of an application for a license, there is no mutual exclusivity under the Act.[38] The reason for this is that when the possibility of a conflict arises, the later arriving user either moves to another frequency within the service, or moves to a new geographic location. This process has worked well for more than fifty years.

Assigning fixed microwave licenses through the auction process would result in a highly inefficient use of the available spectrum. Under the current system, entities seeking to operate new microwave facilities have considerable flexibility in finding ways fit new paths in where possible, even if there are a number of existing paths relatively close by. It also encourages the development of new technologies to allow more use of congested spectrum without causing interference. Thus, while many may view the incidence of frequency congestion in the fixed operational microwave services as a problem in need of a solution, it is also an indication that the spectrum is being utilized to the fullest extent possible. However, if spectrum in CARS and other microwave services were to be assigned through geographic auctions, there would no longer be the same incentives for new licensees to find ways to share the spectrum in congested areas. Instead the auction winner in a

---

37 *NPRM* at ¶ 24.

38 *See Implementation of Sections 309(j) and 337 of the Communications Act of 1934 as Amended*, WT Docket No. 99-87, Notice of Proposed Rulemaking, FCC 99-52, – FCC Rcd –, ¶ 13 (rel. March 25, 1999).

given area could simply exclude all its rivals while utilizing only a fraction of the available spectrum. Alternatively, the auction winner could go into the business of leasing access to paths within its geographic area. This would have the impact of raising the cost of providing telecommunications services artificially, because the holder of the license would not be adding any value to the frequencies. Instead, the auction winners would simply be charging rents for access to frequencies once held in the public trust by the Federal Government. RCN therefore urges the Commission not to auction this or any other point-to-point fixed operational microwave services.

F. The Commission Should Not Impose Any Discriminatory Limitations On The PCOs And OVS Providers Access To CARS

In the NPRM the Commission invited comments regarding several proposed limitations on the PCOs use of the CARS service. For example, the Commission sought comment on only allowing PCO access to CARS licenses on a secondary basis,[39] on imposing minimum subscriber limits,[40] and on requiring PCOs to demonstrate a need to transmit more than ten miles.[41] RCN submits that, as a matter of policy, all similarly situated licensees should be treated similarly. Obtaining access to CARS on equal, nondiscriminatory terms would best promote less costly entry and thereby promote competition and the efficiency gains that competition promotes. Any limitation that reduces the PCOs access to the CARS vis a vis PCOs puts them at a competitive disadvantage in a market where they are still trying to make initial in-roads. The PCOs are not seeking extra-ordinary treatment or seeking the creation of new services or new spectrum allocations. The ICOs

---

39 *NPRM* at ¶¶ 16, 24.

40 *Id.* at ¶¶ 16, 24.

41 *Id.* at ¶ 18.

requests are actually quite modest: to be permitted apply to for licenses that other types of providers in the MVPD industry, their competitors, are already permitted to use.

Turning to the specific limitations suggested in the NPRM. With regard to allowing licensing on a secondary status, this type of licensing is not acceptable because it does not provide certainty with regards to the licensees right to operate from a given location on a given frequency. Few responsible service providers would invest the time and money required to construct a microwave system, knowing that they could be required to shut down at any moment without prior warning by a later-licensed operator with primary status. It also gives ICOs the opportunity to use their ability to obtain primary CARS licenses as a strategy to disrupt either existing or proposed PCO 12 GHz networks. This being the case, RCN does not believe that allowing PCOs access to CARS on a secondary basis would provide meaningful access to the 12 GHz band.

Similarly, imposing minimum subscriber limits would do nothing to promote market entry by new providers.[42] The Commission's aim in this proceeding should be to find a way to encourage market entry as a way of fostering competition with ICOs. Instead, this approach would create a paradox in which PCOs could not have access to the CARS band unless they had an established customer base, but could not establish that customer base without first having access to the inexpensive microwave backbone that CARS offers. This type of arrangement would exclude exactly those carriers that most need access to the spectrum -- those without subscribers that are seeking to enter the market.

---

42 *See NPRM* at ¶ 24.

Finally, with regard to requiring a showing of need to transmit more than ten miles, the Commission should refrain from imposing this type of requirement for the simple reason that it would most likely amount to nothing more than an unnecessary administrative burden for all involved. First, the Commission would have to establish what type of "need" showing is required. For example, would the showing be of technical need, business need or community need? The Commission would also have to establish a standard for determining whether the showing was sufficient. RCN does not believe that this type of process would have any impact on congestion on the CARS frequencies or on the provision of service to unserved areas, but would simply further complicate the process of filing for microwave licenses.

G. A Broad Range Of Services Should Be Permitted In The CARS Frequencies

The Commission asked whether the transmission of voice and data services should be permitted pursuant to CARS licenses.[43] RCN believes that the Commission should permit a limited amount of voice and data traffic over the CARS frequencies. This is especially true given that services are currently being offered in which data, voice and video are all being packaged into single products. RCN believes that allowing a CARS licensee to transmit voice and data over a single 6 MHz channel would provide sufficient bandwidth for most applications while ensuring the basic character of the CARS spectrum as a vehicle for MVPD services.

---

[43] *NPRM* at ¶ 25.

III. CONCLUSION

Wherefore, RCN Telecom Services, Inc. respectfully requests that the Commission amend its rules to so that private cable operators and open video system operators will be eligible for licenses in the Cable Antennae Relay Service on terms equal to all other licensees in that service.

Respectfully Submitted,

Eliot J. Greenwald
James N. Moskowitz
SWIDLER BERLIN SHEREFF FRIEDMAN, LLP
3000 K Street, N.W.
Suite 300
Washington, D.C. 20007
(202) 424-7500

Attorneys for
RCN Telecom Services, Inc.

Dated: August 16, 1999

ATTACHMENT A
TECHNICAL STATEMENT
OF RCN TELECOM SERVICES OF NEW YORK, INC.
REGARDING THE PROPAGATION OF MICROWAVE SIGNALS

RCN Telecom Services of New York, Inc. offers this statement to provide technical information as background and support for RCN's Comments in response to the Federal Communications Commission's Notice of Proposed Rulemaking ("NPRM"), released on July 14, 1999, relating to the eligibility standards in the Cable Antennae Relay Service ("CARS"). In the NPRM as well as in prior filings in this proceeding, the Commission has requested information on the technical characteristics of microwave backbone systems operating at the 12 GHz, 18 GHz and 23 GHz bands. In order to understand the technical advantages and limitations of systems composed of microwave links operating in these different frequencies one must understand some basic principals of physics governing the behavior of microwaves signals. Microwaves are a form of electromagnetic radiation with a frequency of more than one billion cycles per second (1 GHz = 1 billion cycles/second). The entire range of the microwave spectrum is loosely defined as being between 1 GHz and 30 GHz, but there is no exact demarcation. The wavelength of a microwave emission, like all other forms of electromagnetic radiation, is inversely proportional to its frequency. Thus, when the frequency increases, the wavelength decreases, or becomes shorter.

There are a number of factors that affect the propagation of microwave signals. At frequencies above 1 GHz, microwave signals travel in straight lines and are sometimes called "line of sight" paths because they are obstructed by obstacles in their path. Obstructions can include terrain, foliage and buildings. Other factors affecting propagation include attenuation caused by raindrops, fog, dust, absorption by atmospheric gases and interference caused by reflections within the beam which cause parts of the signal to shift out of phase with the rest of the signal.

Typically, the factors affecting propagation tend to be constant within a given path and can therefore be compensated for at the time the path is constructed. In heavily urbanized areas, finding a path with no obstructions so that the transmitters can be placed at an optimal distances is extremely difficult. In the first instance, the ideal locations for transmitters, on high buildings or rooftops, tend to be either fully occupied, extremely expensive, or both. Furthermore, business necessities often dictate that paths be established to connect two points that are not within the line of sight of each

other. This requires that extra links be used to circumnavigate obstructions. This can significantly decrease the effective range of a microwave system.

Perhaps the most important variable in determining the propagation of a microwave signal is rain. Generally speaking, rain attenuation of radio signals occurs when the raindrop size approaches or exceeds one-tenth of the radio signal's wavelength. Rain drops of this size absorb and scatter microwave signals at a high rate, thereby significantly decreasing the distance the signal can travel. As a percentage of time in a given year, rain occurs infrequently, and heavy rain occurs even less often. Because of the inherent difficulty in determining the amount of rainfall an area will receive in advance, the attenuating effect of rain is treated statistically. For the raindrop sizes associated with statistically-expected rain rates, attenuation becomes a problem above 10 GHz and gets progressively worse with higher frequencies. The important factor for microwave attenuation is the size of the raindrop, not necessarily how many raindrops are in the air at a given time. As a result, "heavy rain" is not a function of the number of raindrops in any volume; heavy rain is the determined by the number of larger raindrops in that volume.

In engineering a microwave link, it first must be decided what percentage of the time it is acceptable for the link to be disrupted due to rain. There are commercially available tables which are used to determine the rain intensity, measured in millimeters of rain per hour, that correspond to the acceptable outage duration. For example, in systems like RCN's which require an availability of 99.99 percent, equaling link outages of less than 0.01 percent of the time, or 52 minutes per year, the system must be designed to overcome a rain intensity of up to 42 mm per hour. To maintain 99.99 percent availability on a 5 km path at 10 GHz, the rain typically produces an attenuation of 5.5 dB.[44] At 18 GHz, the attenuation increases to about 17.4 dB. At 25 GHz, it is 29.6 dB, and at 40 GHz it is 54.2 dB.

For the same amount of spectrum in different frequency bands, this greater attenuation translates into lower spectrum value in several ways. First, rather than using 5 km path lengths at 18 GHz, it becomes necessary to use shorter paths, only 2 or 3 km at 23 GHz. This translates

---

[44] A dB, or decibel loss budget, is a logarithmic measure of the relative power between transmission and receive points.

directly into higher system implementation costs, because it requires more transmitter sites to cover a metropolitan area. For example, a 5 km path at 18 GHz must overcome 17.4 dB of attenuation during rain. But the same attenuation occurs on a 3 km path at 23 GHz. If transmitter sites must be spaced 3 km apart rather than 5 km, it takes (5/3 squared) = 25/9, or nearly three times the number of transmitter sites to cover an area.

There are a limited number of ways to overcome the effects of rain attenuation. Increasing system gain, that is, increasing the transmitter power and / or antenna size is one way. Unfortunately, the benefits of this approach are minimal compared to the cost. Another method involves increasing the system's fade margin by using receiver "automatic gain control" ("AGC"), which amplifies received signals that are experiencing fades below certain levels. While AGC can prevent the total failure of a system during heavy rain, it cannot fully compensate for rain attenuation. Once the signal is attenuated, it is gone and the only thing that can be done is to try to capture and boost what signal remains.

Rain attenuation at higher frequencies can also be overcome by using more spectrum, but using it less efficiently. A less efficient modulation method is more robust, but at the expense of decreased capacity. This is why, for example, the Digital Electronic Messaging Service ("DEMS") was given more spectrum when it was moved from 18 GHz to 24 GHz. However, because private cable systems are used as backbone networks carrying multichannel video programming, it is not feasible to maintain the same service level, *i.e.* offer the same number of channels, in the 24 GHz band. This is not a factor in DEMS.

Thus, while the 12 GHz bands experience rain attenuation in the same manner as do the 18 GHz and 23 GHz bands, the extent of degradation of the signal is substantially less. This equates to longer beam paths allowing the coverage of an area with substantially fewer links and therefore less cost.

CERTIFICATE OF SERVICE

I, Ivonne J. Diaz, hereby certify that on this 16th day of August 1999, copies of the foregoing Comments of RCN Telecom Services, Inc. were hand delivered to the following parties.

Magalie Roman Salas, Esq.
Secretary
Federal Communications Commission
445 12th Street, S.W.
Suite TW-325
Washington, D.C. 20554

International Transcript Service
1231 20th Street, N.W.
Washington, D.C. 20554
(Disk Copy)

Carolyn Fleming
Federal Communications Commission
Cable Services Bureau
445 – 12th Street, S.W.
Washington, D.C. 20554
(Disk Copy)

Ivonne J. Diaz